which this will happen is not entirely clear. However, a review of the literature on universal service reveals a dearth of discourse concerning the possible utility of wireless technologies and services as part of any policy on universal service.

The wireless industry is poised to extend its reach beyond traditional cellular and other analog wireless offerings through the use of PCS and wireless local loop technologies. Recent advances in technology and the relaxed regulatory policy embodied within the Act have helped to change the traditional concept of wireless as a group of discretionary services for business and the well-to-do, to the point where it is increasingly viewed as a potential substitute for the wireline local loop in terms of both price and functionality. Wireless telecommunications is no longer just a special service for a limited and highly targeted population. It is becoming an integral part of a global telecommunications system geared to services to individuals rather than a location. (Pelton:1995) In the United States, it is possible that in some urban settings where infrastructure has decayed or otherwise become inadequate for the provision of high-quality, reliable telephone service, that wireless technologies could be used to maintain connectivity for the *residentially transient.*

At the current rate of technological change, there is no way to know whether low-cost universal service to rural areas and poor urban areas is best provided by copper wires, as it is today, or by some form of wireless service. (Business Week:1996) With the advent of wireless local loops and PCS, the time may be fast approaching when wireless carriers stand ready to assume universal service obligations and serve as carriers of last resort. Wireless carriers may have an advantage in the push to develop competitive markets in telecommunications because the Act focuses primarily on wireline industries

and issues (such as telephony and cable television) and ignores many issues within the wireless sector of the industry (including cellular, satellite and television broadcasting). (Heritage:1996)

Policy makers that only look at wireless for rural subscribers or school and library interconnection are missing a significant use for these technologies and services. Given the characteristics of low-income urban residents, wireless in some form may provide the means necessary to narrow the unacceptable gap that exists between low-income and more affluent Americans. By providing wireless carriers with the incentives to serve low-income residents, it may be possible to stem the flow of minorities and women from the network. In the end, the positive externalities flowing from increased numbers on the network should more than offset the cost of extending access into this underserved portion of the economy.

The research demonstrates that there is a significant percentage of the U.S. population that is going unserved for a variety of reasons. The majority of that group are low-income, and are also mobile, moving frequently. It is exactly because of these characteristics that many of them fall off the network and stay off. At the same time, wireless local loop and services such as PCS are becoming viable suppliers of service particularly suited to their needs. With properly targeted subsidies, and fueled by falling costs to the consumer for wireless technology, wireless could increase telephone penetration among the *residentially transient*.[20]. (NY Times: March 4, 1996)

[20] In fact, some foresee a world where even students will only have wireless phones without even bothering to get a land line installed

Very little scholarly attention has been paid to the notion of wireless services as an input in universal service policies. This is most likely due to the fact that wireless services have never been viable substitutes for existing wireline services, which were developed in a monopoly environment under the regulatory contract discussed above. The immature nature of wireless technologies has meant that they were never seriously considered in the universal service debate. With the advance of new technologies, that notion is rapidly changing. [21] Section 254, which views universal service as an evolving concept which takes into account advances in telecommunications and information technologies, clearly contemplates the maturation of wireless services as part of the universal service concept.

The structure of the Act contemplates the development of a competitive environment which will obviate the need for extensive universal service supports. Over time, it is hoped that these supports will be significantly reduced or eliminated as the players in the competitive market vie for consumers attention. If technology and regulation continue their current respective rates of development, wireless services stand to play a big part in this process.

In the meantime, however, regulatory barriers which deny wireless carriers the opportunity to access Lifeline, Link-Up and other universal service support funds

[21] Up until this point, emergency services (911 or E911) could not easily be accessed using wireless technologies. In such cases, the justification for using wireless as a universal service input to ensure access to such services falls away. However, recent advances in digital wireless systems and PCS, as well as cooperation among emergency services providers and wireless carriers, has resulted in greatly improved access to E911 services. (Pelton:1995)

eliminates any incentive for these carriers to seek to provide service to a group whose characteristics it appears they are perfectly suited to serve.

A. The Technical Case

From a technical standpoint, it appears that wireless technologies have a greater chance of reaching that portion of low-income urban nonsubscribers that desires to be reconnected to the network. Based upon the mobile nature of this customer group, a characteristic that has only recently come to light, wireless services and technologies are a logical choice. Up until this time, price appears to be the only reason that this connection has not been made. With some reform to the existing regulatory and support structure, this factor could dissipate and make wireless the technology that helps to eradicate a significant portion of the persistent 5-6% lag in universal penetration.

Due to recent innovations in technology, it has been argued that since duplicating the wireline local loop network is cost prohibitive, high-capacity digital wireless networks offer the best hope for true competition. (Crains:1996) For example, the cost of deploying every foot of fiber has gone up. In many cases, cities have attempted to assess fees, access is difficult and there is resistance to tearing up the street. It can cost between $1,000 to $2,500 per subscriber to deploy wireline technology, especially in sparsely populated areas, while radio access technology averages about $1,000 per subscriber, according to a variety of studies. (Local Competition Report: April 1, 1996; see also, Kellogg et al.:1992, ed & Supp.1995)

As was stated above, the complete substitution of wireless voice services for voice telephony has never previously been a serious possibility due to the limited system

capacity, limited service provision, relative expense and low service quality of cellular service. The search for distinguishing service features and infrastructure cost savings is pointing personal communications services players in the direction of wireless loop access.[22] Two wireless technologies which many believe will provide the most vigorous challenge to existing wireline services are PCS and fixed wireless local loop technologies. If recent developments are any indicator, these technologies will provide the foundation for a facilities based competitive market in the local exchange which will extend universal service to all that desire it.

Fixed wireless local loop systems are an alternative for people in areas where infrastructure costs are high, in that it reduces some of copper's high costs. (NY Times: March 4, 1996) In fact, fixed cellular and newer wireless technologies were identified in the recent FCC Subscribership NPRM as possible lower-cost alternatives to traditional wire loops for serving small populations in remote areas. (FCC:1996)

MCI recently commissioned a study by Hatfield Associates to determine the cost of providing local telephone service. In that study, Hatfield determined it is cheaper to serve smaller, less populated markets using wireless than using wireline technology. (FCC:1996) Unfortunately, to date there has been insufficient study to determine the potential for using wireless as a substitute for existing wireline technologies to serve low-income subscribers in urban areas.

Clearly, wireless can provide basic voice telephone service for universal service purposes. Whether they can do so in response to the problems inherent in the low-income

[22]Customers of Sprint Spectrum's Washington- Baltimore trial have responded enthusiastically to a pricing structure 10%-40% lower than cellular with superior clarity due to its digital network. (PR Newswire:

urban nonsubscriber group is yet to be seen. Terrestrial "wireless local loop" systems may provide the means to address many of the characteristics of *residential transience* that appear to permeate the low-income urban nonsubscriber group. With wireless local loops, signals are broadcast from a tower to homes in a surrounding area that can range up to 20 miles or more. (OTA:1995) The signals are received by antennas mounted on the sides of houses or on nearby poles. For rural residents the advantages of wireless in many situations are quite obvious. However, for urban locales the evidence may not be so clear. Although wireless has a cost advantage over copper in rural and suburban situations, it is unclear whether it is competitive in cost to copper when used for the much larger number of short urban loops. (OTA:1995) Clearly, more research needs to be done to determine the extent to which emerging technologies in the wireless family can be used to address these difficult circumstances.

Whether the actions of the FCC, combined with state and federal regulation, will provide for effective competition in the local loop remains unclear because, while the Act has passed, it is a long way from being implemented. Furthermore, the impact of PCS and other wireless services on the local exchange market remains undetermined. (Warner:1996) Some have speculated that the majority of consumers will not see the benefits of the Act until after the turn of the century. (Barrett:1996) Nonetheless, it is clear that there are reasons to believe that wireless technologies can be utilized to help fulfill the twin goals of the Act, effective competition and universal service.

March 25, 1996)

B. The Business Case

From a business case perspective, the combination of recent technological and regulatory innovation, coupled with an increase in the quantity and quality of information regarding the characteristics of low-income urban nonsubscribers has made this customer segment attractive. With the appropriate safeguards to avoid disconnection for high toll usage, and an assortment of various other regulatory reforms, it is probable that this overlooked group of customers would become quite profitable to serve. Given the mobile nature of this group, it appears that wireless is the most efficient means to accomplish and maintain reconnection to the network.

The new Act, which amends the Communications Act of 1934 in large part, has been hailed by many as a defining moment in the history of the communications industry. (Canis & Soriano:1996) While the passage of the Act is significant for all communications concerns, it has less direct impact on the issues confronting the wireless industry. In fact, the main impact of the Act for wireless may be that it leaves the area alone for the most part. According to A.T. Kearney, one of the top ten implications of the Act is the fact that it gives wireless carriers a long-term competitive advantage over wire-based carriers. (A.T. Kearney: 1996) For his part, Reed Hundt, Chairman of the FCC has pledged that the Commission is committed to promoting wireless competition by opposing unnecessary regulation of the industry. As examples of this policy, Hundt pointed to the preemption of state price regulation and local regulation of wireless cell construction. (Washington Telecom News: April 1, 1996)

Irrespective of whether one views the Act as the defining moment in telecommunications history or merely the beginning of a long, laborious process of rulemakings and litigation, it is clear that something important has happened. However, there is a great deal that must still be done to achieve the dream of multiple, complementary competitive communications markets. While some believe that wireless and satellite-based communications services are on the threshold of giving incumbent LEC's a run for their money, how the FCC handles pending interconnection, mutual compensation and interoperability matters will impact when these players become a strong enough force to drive prices and universal subsidies down. (Crains: April 22, 1996) In addition, under the Act, Congress preempted state or local regulation of rates or entry of wireless services. It also authorized the FCC to preempt local regulations that interfere with the federal regime. [23]But deciding which local regulations fall before the federal scythe may not be easy. Wireless service defies state borders, and identifying barriers to entry can be a matter of hotly disputed opinion. (Legal Times: April 1996)

Whether regulation of wireless and wireline providers should be symmetrical or asymmetrical is a contentious issue. According to the BOC's, comparable services should be regulated in the same way, regardless of the whether the mode of delivery of local services be copper, fiber or radio waves. Obviously, wireless carriers have a different view. In the current FCC NPRM on CMRS provision of fixed wireless local loop services, comments have typically fallen along industry lines, with wireless

[23] To date, many states still have legislation which proscribes the entry of competitive firms into the local exchange market. (FCC:1996)

carriers arguing for regulatory flexibility, and state regulators and LEC's arguing for symmetrical treatment of the local exchange access substitute. (Land Mobile Radio News: March 8, 1996) On the other hand, a recent NARUC resolution strongly urged the FCC not to preempt state regulators in intrastate, fixed, wireless communications services, which NARUC maintains falls under state regulatory jurisdiction.

The debate goes to the heart of the regulation of the local loop, and whether a fixed wireless local loop is a wireless service to be regulated at the federal level, or a local loop to be regulated at the state level. (Public Utilities Fortnightly:1996) The resolution of the issue will determine to a great extent the enthusiasm of new entrants to undertake to serve those customers that have gone off the network. If the incumbent LEC's service is subsidized, potential market entrants are competitively disadvantaged unless they can receive the subsidies too. This artificial pricing advantage may mean that new entrants will decline to enter markets even if they would be able to provide service at lower costs than the incumbent provider. (FCC:1996)

Depending upon the technology utilized, there may have to be a trade-off in the form of degraded service quality for wireless to reach low-income urban nonsubscribers at an affordable level. This raises an interesting question as to whether we have set a standard of telephone service quality that is so high that it has actually forced some of those people off of the network whose service we were trying to maintain with the existing support mechanisms. If so, perhaps policy makers need to analyze whether accepting a lower quality of service will allow more low-income urban nonsubscribers to connect to the public network.

V. Conclusion and Recommendations for Future Research

During this period of tremendous change in the telecommunications regulatory environment, it is critical that policy makers take great care to reform regulations and policies that no longer apply. Any plan for a more competitive telecommunications industry must have a long term vision that defines policy goals and matches them with regulatory instruments to achieve these goals. It also must provide mechanisms for dealing with the transition from the current state of affairs to that which is desired in the long-run. (Cherry & Wildman:1996) In the instant case, the concept of *residential transience* demands a reformation of current policies regarding universal service support mechanisms. That reformation should be based upon a long term goal of maximum connectivity. Revised policies should take note of the fact that current regulatory policies have failed to address the apparent characteristics and circumstances of a significant customer group – low-income urban nonsubscribers. While ideally it would be preferable to have the competitive market correct the failure of the regulatory apparatus to ensure the connectivity of this group, experience under current schemes reveals that they are inadequate. A new policy is required, which recognizes both the specific problem that needs to be addressed, as well as the policies that are needed to address that problem. For those who are *residentially transient*, it appears that the best policy to fit their particular characteristics may be one that promotes the use of wireless technologies, coupled with a targeted support scheme.

Universal service and competition policies have developed along different tracks over the last decade or so, with policy makers recognizing the potential for competition to supplant some of the regulatory mechanisms designed to ensure universal availability of

telephone service. These policies have been directed at securing an opportunity for low-income and rural residents to connect to the public telephone network.

Aside from an occasional mention in relation to rural high cost situations, wireless services and technologies have developed independently. While wireless policies have gradually increased the number of providers that can compete in local telephone markets, this is a relatively recent phenomenon. This, coupled with the general technological immaturity and high cost of wireless have resulted in wireless being ignored as a serious input into universal service policy. Recent innovations in regulatory policy and technology, coupled with preliminary findings in recent research on the characteristics of nonsubscribers have afforded policy makers an opportunity to bridge these parallel dimensions for at least a portion of the persistent 5%-6% gap in universal telephone penetration.

Before the potential of wireless can be applied as a viable input in universal service policies, however, specific regulatory reforms on a number of levels are needed. Lifeline and Link-Up, universal service, funding of ETCs, interconnection and unbundling regulations all stand as potential barriers to wireless as a universal service input. Reform of these regulations, coupled with additional research into the specific characteristics and needs of the low-income urban population will help to tap the true potential of this resource and make quality telephone service available to Americans that want it.

Finding the right mix of regulation and competition to best serve the public interest and maintain a viable local telephone system is an imposing task. (Cullari:1995) In order to fulfill the promise and intent of the Telecommunications Act of 1996, it is

imperative that policy makers recognize and promote the potential of wireless services and technologies. Given the dual focus of the Act on competition and universal service, no technology appears better suited than wireless. However, a significant amount of research needs to be done to clarify what the characteristics of *residential transience* are. Research is also needed to determine what place wireless should occupy in the universal service debate. As a general proposition, further research needs to be conducted to address the dearth of information confronting policy makers regarding the characteristics of low-income nonsubscribers.

During this period, regulators must craft policies suited to the dynamics of the markets in their jurisdictions, allowing room for adjustment as the conditions in those markets change. Information must be gathered and analyzed in a timely manner to ensure that policy decisions are based upon the most current information. At a minimum, baseline assessments of penetration levels must be evaluated and preliminary and long-term goals established for the targeting of groups which consistently go un- or under-served. Consistent monitoring of service quality will be critical during this period, to ensure that existing customers do not suffer as competitors seek to expand their customer base or protect their share of the market. In addition, the FCC and the states should pay particular attention to issues such as consumer demand for telecommunications services, the ability of the existing infrastructure to satisfy that demand (and any reasonable projections of demand growth), and the characteristics of customer groups that fall below a reasonable level of penetration.

Submitted by:

Robert K. Lock, Jr.

REFERENCES

Barnett & Carroll, *How Institutional Constraints Affected the Organization of Early U.S. Telephony*, (1993) Journal of Law, Economics and Organization, Vol.9, No. 1, pp. 98-126.

Belinfante, A., *Telephone Subscribership in the United States*, FCC Common Carrier Bureau, Industry Analysis Division (December 1995)

James C. Bonbright, "Principles of Public Utility Rates," (New York: Columbia University Press, 1961).

Cherry, B. & Wildman, S., *A Framework for managing Telecommunications Deregulation While Meeting Universal Service Goals*, Northwestern University (1996)

Crandall, Robert W., and Sidak, J. Gregory, *Competition and regulatory Policies For Interactive Broadband Networks*, Southern California Law Review, Vol.68, p. 1203 (July 1995)

Cullari, Samuel F., *Divestiture II: Is The Local Loop Ripe For Competition?*, CommLaw Conspectus, Vol. 3, p. 175 (Summer 1995)

Demsetz, *"Why Regulate Utilities?,"* Journal of Law and Economics, Vol. 11 (April 1968) pp. 55-66.

DuPont, Debra, FCC, *Preparation for Addressing Universal Service Issues: A Review of Current Interstate Support Mechanisms*, Common Carrier Bureau, Universal Service Task Force (February 23, 1996)

Electronic Buyer's News, "Big Hopes Riding on 1996 Telecom Act," No. 997 (March 11, 1996) p. 25.

Electronic Design, *"Top 10" Implications of the New Telecommunications Act*, Vol.44, No.7 (April 1, 1996)

FCC, Industry Analysis Division, *Monitoring Report May 1995, CC Docket No. 87-339*, (1996).

Fischer, C., *America Calling: A Social History of the Telephone to 1940*, University of California Press, Oxford (1992)

Fortune Magazine, "The Race to Rewire", (April 1993)

Gotts, I., and Rutenberg, A., *Navigating the Global Information Superhighway: A Bumpy Road Lies Ahead*, Harvard Journal of Law & Technology, Vol. 8, p. 275 (Spring 1995)

Hunter, Harvey E., *"Pricing Telephone Service in the 1980's,"* in Danielsen & Kamerschen, Current Issues in Public-Utility Economics, (Lexington Books: D.C. Heath & Co., Lexington, Mass., 1983).

Joskow, Paul, *Regulatory Failure, Regulatory Reform, and Structural Change in the Electric Industry*, Brookings Papers: Microeconomics, (1989) pp. 125-199.

Kaserman & Mayo, "Long-distance Telecommunications: Expectations and Realizations in the Post-Divestiture Period," in Incentive Regulation for Public Utilities, Michael A. Crew, Editor (Boston, Mass.: Kluwer Academic Publishers), 1994.

Lake, William T., and Charytan, Lynn R., *Getting What You Pay For*, Legal Times, (April 22, 1996)

Land Mobile Radio News, *Regulatory Parity for CMRS Local Loop Services Debated*, Vol.50, No.10 (March 8, 1996)

Levy & Spiller, *"The Institutional Foundations of Regulatory Commitment: A Comparative Analysis of Telecommunications Regulation,"*, Journal of Law, Economics and Organizations, Vol. 10, No. 2 (1994).

Murdoch, G., Golding,P., *Information Poverty and Political Inequality: Citizenship in an Age of Privatized Communication*, Journal of Communication, vol. 39, No.3 180-195 (1989)

New York Times, *Future Communications*, (March 4, 1996)

On the Air: Wireless Local Competition to Explode by Decade's End, Local Competition Report, Vol.5, No.7 (April 1, 1996)

Mueller, Milton, "*Universal Service in Telephone History*," Telecommunications Policy, (July 1993).

McConnaughey, J., Nila, Cynthia A., Sloan, Tim et al., *Falling Through the Net: A Survey of the "Have Nots" in Rural and Urban America*, U.S. Department of Commerce, National Telecommunications and Information Administration (July 1995)

NTIA, *Reply Comments of the National Telecommunications and Information Administration* in CC Docket No. 95-115, In the Matter of Amendment of the Commission's Rules and Reguations to Increase Subscribership and Usage of the Public Switched Network, (March 29, 1996)

Pearce, Alan, *Wireless Would Grow If Pricing Changed, Fell*, America's NETWORK, June 1, 1996.

Pelton, Joseph N., *Wireless and Satellite Telecommunications: The Technology, The Market & The Regulations*, Prentice Hall PTR, Upper Saddle River, NJ (1995)

Phillips, A., "*Promoting Competition in Regulated Markets*," (Washington D.C.: The Brookings Institution, 1975).

Phillips, Charles F. Jr., "The Regulation of Public Utilities: Theory and Practice," 1988 Public Utilities Reports, Inc., Arlington, Va.

Pool, Ithiel de Sola, *Technologies Without Boundaries: On Telecommunications in a Global Age*, Harvard University Press, Cambridge, MA. (1990)

Porter, Michael E., *"How Competitive Forces Shape Strategy"*, Harvard Business Review, March-April 1979, 137-45.

Public Utilities Fortnightly, *Who Should Pay for "Stranded Investment," and Why?*, June 1994, at 47.

Shin & Ying, "Unnatural Monopolies in Local Telephone," RAND Journal of Economics, Vol. 23, (Summer 1992), pp.171-183.

Schement, Jorge R., *Beyond Universal Service: Characteristics of Americans Without Telephone, 1980-1993*, Telecommunications Policy, Vol.19, No.6, pp.477-485 (1995)

Schuler, Joseph F., Jr, *NARUC in Winter: Resolutions Generated Heat (electricity) and Warmth (telecommunications, environment)*, Public Utilities Fortnightly, (April 15, 1996)

U.S. Congress, Office of Technology Assessment, *Wireless Technologies and the National Information Infrastructure*, OTA-ITC-622 (Washington, DC:U.S. Government Printing Office, July 1995)

Warner, Lisa M., *Wireless Technologies Creating Competition in the Local Exchange Market: How Will Local Exchange Carriers Compete?*, CommLaw Conspectus, Vol.4 p. 51 (Winter 1996)

Washington Telecom News, *Hundt Believes In "Hands-Off" Approach For Wireless*, Vol.4, No.13 (April 1, 1996)

Wayne, Debra, *FCC Fields Panelist Comments on Universal Service Options*, Crain's Radio Communications Report (April 22, 1996)

Wayne, Debra, *BOC's Request Parity Under FCC's Wireless Local Loop Proposal*, Crain's Radio Communications Report (March 11, 1996)

BIOGRAPHY

Robert K. Lock, Jr.
Vice President
Competitive Strategies Group, Ltd.
70 East Lake Street
Suite 630
Chicago, IL. 60601
(312) 236-0405
BobLock@nwu.edu

The author is Vice President of The Competitive Strategies Group, Ltd., a Chicago based consulting firm specializing in the analysis of competitive market issues in the telecommunications and energy fields. He is a former Legal and Policy adviser to Commissioner William M. Dickson of the Illinois Commerce Commission, and served on the staff subcommittee on communications of the National Association of Regulatory Utility Commissioners (NARUC), and the Telecommunications Industries Analysis Project (TIAP), a research consortium dedicated to neutral analysis of current telecommunications policy issues. He is a former Assistant State's Attorney specializing in telecommunications and energy issues before the Illinois Commerce Commission and the Illinois Appellate Courts. He is currently completing his MA/Ph.D. in Telecommunications Management, Science & Policy at Northwestern University. Graduate of University of San Francisco, and John Marshall Law School. Author and co-author of numerous articles on network interconnection, PCS and universal telecommunications service policy.

Selected Publications

Cellular to PCS: A Wireless Primer, Weinhaus, C., Lagerwerff, C., & Lock, R. et al., Telecommunications Industries Analysis Project, presented at NARUC Winter conference, Washington, D.C., February 25, 1995. Distributed as public information on PCS in the US by the FCC Wireless Telecommunications Bureau.

Breaking the Bottleneck & Sharing the Wealth: A Perspective on Universal Service Policy in an Era of Local Competition, Lock, R., presented at "Universal Service in Context: A Multi-disciplinary perspective," conference at the Communication Media Center, New York Law School, December 6, 1995.

Overview of Universal Service, Weinhaus, C., Lock, R., et al, Telecommunications Industries Analysis Project, presented at "Universal Service in Context: A Multi-disciplinary perspective," conference at the Communication Media Center, New York Law School, December 6, 1995.

Loop Dreams: The Price of Connection for Local Service Competition, Weinhaus, C., Lock, R., et al., Telecommunications Industries Analysis Project (July 1995)